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A RULE FOR UPDATING AMBIGUOUS BELIEFS

ABSTRACT. When preferences are such that there is no unique additive prior, the issue of which updating rule to use is of extreme importance. This paper presents an axiomatization of the rule which requires updating of all the priors by Bayes rule. The decision maker has conditional preferences over acts. It is assumed that preferences over acts conditional on event E happening, do not depend on lotteries received on E^c , obey axioms which lead to maxmin expected utility representation with multiple priors, and have common induced preferences over lotteries. The paper shows that when all priors give positive probability to an event E , a certain coherence property between conditional and unconditional preferences is satisfied *if and only if* the set of subjective probability measures considered by the agent given E is obtained by updating all subjective prior probability measures using Bayes rule.

KEY WORDS: Ambiguous beliefs, Bayesian updating, Dynamic choice, Multiple priors, Uncertainty aversion

1. INTRODUCTION

The Savage (1954) model of decision making under uncertainty prescribes that a decision maker has a unique prior probability and a utility function such that decisions are made so as to maximize the *expected utility*. However, there exists a large body of empirical evidence which contradicts Savage's subjective expected utility model (see Camerer and Weber, 1992). In particular, behavior such as that exhibited in the Ellsberg Paradox (1961) is inconsistent with that approach. The main problem is that the *ambiguity* that is common in situations of uncertainty cannot be captured in the representation of beliefs by a single prior. This is the motivation behind several nonexpected utility models, which have been presented in the literature in the last two decades.

Among the generalizations of decision making under uncertainty we would like to refer two types of models: the non-additive probabilities and the multiple priors model. The first type of model was first introduced by Schmeidler (1982, 1989), but was also axiomatized,



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